I/We Claim:

1. An optical add/drop multiplexer (OADM) arranged to add v optical channels to, and remove w optical channels from, an input wavelength division multiplexed optical communication signal containing x optical channels, in order to generate an output wavelength division multiplexed optical communication signal containing y optical channels, said OADM comprising

a programmable demultiplexer having an input port and K output ports, said programmable demultiplexer arranged to receive said input signal containing said x optical channels on said input port and distribute one or more of said channels to each of said K output ports, wherein one of said K output ports is a through port containing z optical channels and wherein the remaining K-1 of said output ports are the drop ports of said OADM, and wherein said K-1 output ports cumulatively contain said w optical channels,

a programmable multiplexer having M input ports and a single output port, said programmable multiplexer arranged to receive said z optical channels on one of said input ports and said v optical channels on the remaining M-1 of said input ports, and combine all of said channels on said M input ports onto said output port, to generate said output wavelength division multiplexed optical communication signal containing said y optical channels, and

means for controlling (a) said demultiplexer to route desired drop and through channels from said input port of said OADM to said K output ports and (b) said multiplexer to route desired add and through channels from said M input ports to said output port of said OADM,

wherein M and K are integers equal to or greater than 2 and wherein v, w, x, y and z are integers.

2. The invention defined in claim 1 wherein each channel from said w optical channels are distributed to a unique one of said K-1 output ports of said programmable demultiplexer.

3. The invention defined in claim 1 wherein each channel from said v optical channels is received by a unique one of said M-1 input ports of said programmable multiplexer.

4. The invention defined in claim 1 wherein more than one channel from said w optical channels is distributed to at least one of said K-1 output ports of said programmable demultiplexer.

5. The invention defined in claim 1 wherein more than one channel from said v optical channels is received by at least one of said M-1 input ports of said programmable multiplexer.

6. The invention defined in claim 4 wherein one or more of said K-1 output ports that contains more than one channel are each applied to a respective additional demultiplexer.

7. The invention defined in claim 5 wherein one or more of said M-1 input ports that contains more than one channel are each received from a respective additional multiplexer.

8. An optical add/drop multiplexer (OADM) arranged to add a first group of one or more optical channels to, and remove a second group of one or more optical channels from, an input wavelength division multiplexed optical communication signal containing a third group of one or more optical channels, in order to generate an output wavelength division multiplexed optical communication signal containing a fourth group of one or more optical channels, said OADM comprising

a programmable wavelength switch having (a) a primary input port, (b) M-1 additional input ports constituting the add ports of said OADM, (c) a primary output port, and (d) K-1 additional output ports constituting the drop ports of said OADM, said programmable switch arranged to (i) receive said input signal containing said third group of optical channels on said primary input port and distribute one or more of said channels to each of said K-1 additional output ports, wherein said K-1 output ports cumulatively contain said second group of optical channels, and (ii) combine all of said channels on said M-1 additional input ports onto said primary output port, to

generate said output wavelength division multiplexed optical communication signal containing said fourth group of optical channels, and

means for controlling (a) said demultiplexer to route desired drop and through channels from said input port of said OADM to said K output ports and (b) said multiplexer to route desired add and through channels from said M input ports to said output port of said OADM,

wherein M and K are integers equal to or greater than 2.

9. An optical add/drop multiplexer (OADM) arranged to add a first plurality of optical channels to, and remove a second plurality of optical channels from, an input wavelength division multiplexed optical communication signal in order to generate an output wavelength division multiplexed optical communication signal, said OADM comprising

a programmable demultiplexer having an input port and K output ports, said programmable demultiplexer arranged to receive said input signal on said input port and distribute one or more of said channels to each of said K output ports, wherein one of said K output ports is a through port containing a plurality of optical channels and wherein the remaining K-1 of said output ports are the drop ports of said OADM, and wherein said K-1 output ports cumulatively contain said second plurality of optical channels,

an M port programmable multiplexer having M input ports and a single output port, said programmable multiplexer arranged to (i) receive (a) on one of said input ports, said plurality of optical channels output on said one of said K output ports of said programmable demultiplexer and (b) said first plurality of optical channels on the remaining M-1 of said input ports, and (ii) combine all of said channels on said M input ports onto said output port, to generate said output wavelength division multiplexed optical communication signal, and

means for controlling (a) said demultiplexer to route desired drop and through channels from said input port of said OADM to said K output ports and (b) said

multiplexer to route desired add and through channels from said M input ports to said output port of said OADM.

10. The invention defined in claim 9 wherein said programmable demultiplexer comprises

a first optical beam dispersing means,

a first optical beam focusing means aligned to said optical input port and arranged to collimate the input signal,

a micro-lens array containing K lenses, each lens aligned to a respective one of said K output ports,

means for directing the collimated input signal to be incident on said first optical beam dispersing means, whereby said components are angularly dispersed at distinct propagation angles according to wavelength, thereby forming N separate beams having different wavelengths,

a micro-mirror array containing N tilting micro-mirrors,

a second optical beam focusing means arranged to collect each of said N separate beams and generate, for each said beam, a converging beam focused onto a particular micro-mirror in said micro-mirror array, and

means for individually controlling each mirror in said micro-mirror array to reflect the incident beam in a desired direction, such that said beam (a) is collimated by a third optical beam focusing means, (b) redirected to a second optical beam dispersing means, and (c) coupled from said second optical beam dispersing means through a particular lens in said micro-lens array to a desired one of said output ports.

11. The invention defined in claim 9 wherein said M port programmable multiplexer comprises

a microlens array that contains K+1 lenses, wherein (a) one lens is aligned with the output port, while the remaining lenses are aligned each to a corresponding input port, and wherein (b) each input signal is collimated by a respective lens in said microlens array,

a micro-mirror array containing N tilting micro-mirrors

means for directing the resultant collimated beam originating from each input port to be incident on a diffraction grating, which diffracts the optical signal as a function of its wavelength, said diffraction grating being arranged such that each of the separate beams, which has a unique wavelengths and therefore distinct propagation angle, propagates to a particular micro-mirror in said micro-mirror array, and

means for individually controlling each mirror in the array to reflect the incident beam representing a corresponding wavelength in a desired direction, such that it will be redirected to a single location on the diffraction grating, and coupled from the diffraction grating to the output port through the particular lens in the micro-lens array that is aligned with the output port.

a microlens array that contains M+1 lenses, wherein (a) one lens is aligned with the output port, while the remaining lenses are aligned each to a corresponding input port, and wherein (b) each input signal is collimated by a respective lens in said microlens array,

means for directing the resultant collimated beam originating from each input port to be incident on a diffraction grating, which diffracts the optical signal as a function of its wavelength, said diffraction grating being arranged such that all of the separate beams, which have different wavelengths and therefore distinct propagation angles, propagate to a particular micro-mirror in a micro-mirror array, and

means for individually controlling each mirror in the array to reflect the incident beam representing a corresponding wavelength in a desired direction, such that it will be redirected to a single location on the diffraction grating, and coupled from the diffraction grating to the output port through the particular lens in the micro-lens array that is aligned with the output port.